University of Bahrain
College of Information Technology
Department of Computer Science
ITCS341: Object-Oriented Systems
2nd Semester, 2014/2015
Final Examination

Date: 7th June 2015 **Time: 8:30-10:30 AM**

Student ID:	
Student Name:	
Section #	

Instructions for students

1. Ensure that you have eight pages and six main questions in the paper.
2. All questions must be answered within the two hours.
3. The marks allotted to each question is clearly written at the top of each.
4. You may answer/complete the first question in the question paper.
5. Questions two-six must be answered in the answer booklet provided.
6. This question paper must be submitted along with the answer booklet.

1. Clearly Circle The Best Answer (5 points)

I. An Abstract class

a) Is a child class in an inheritance relationship.

b) Is a component class in a composition relationship.

c) Is implemented as an object of two classes or more.

d) Is a super class with no direct instances/object.

II. A Polymorphic Method

a) A method that is used to update a super class attribute.

b) A method used to link other classes.

c) A method in a super and child classes with the same signature.

d) Used in an association relationship to access the linked objects.

III. An Event

a) Is an interaction between an actor and a system.

b) Is an occurrence at a point of time that triggers a change in the state.

c) Is an activity that is drawn as part of an activity diagram.

d) Allows an object to be more durable.

IV. Collaboration Diagram

a) Shows how objects in a system collaborate to complete a task.

b) Shows the states a system go into in its life cycle.

c) Shows the system processes in steps like an activity diagram.

d) Used to describe the classes and their relationships.

V. Design patterns

a) Are solutions to general problems offered by experienced developers.

b) Are ways to develop a system that have special interfaces.

c) A special way used to design object oriented systems.

d) Popular with systems that require human interactions.

2. Object Oriented Concepts (9 points)

   I. Briefly describe the commonly used method (in domain analysis) to find classes from a requirements document (or the problem statement) as discussed in the lectures.

   II. Illustrate how an activity diagram is drawn in UML showing its various parts? You may use an example to do so.

   III. Briefly explain the three types of relationships associated with use cases? You may use an example to do so.

3. Use Case Description (6 points)

Write a suitable **use case description** (using the format learnt in the lectures) for a "withdraw" operation carried out by a bank customer at an ATM machine with at least one exception.

Bank Customer

4. Sequence and Class Diagrams (7+7=14 points)

Given the following scenario for purchasing a book from a bookshop:

Scenario:

Yousef requests to purchase a book from the bookshop giving its title.

The salesman selects the purchase option from the main menu.

The purchase menu is displayed and he/she enters the book title into the system.

The system retrieves from the database the book record and displays the book's title, author, price, bookshop location and available copies.

The salesman then enters the number of copies to be sold and acknowledges the sales operation.

The system completes the operation by creating a new sales record for the book.

A receipt is automatically printed for the customer.

The system then returns to the main menu.

You are required to do the following:

I. Draw an elaborated sequence diagram for the above scenario.
II. Draw a detailed class diagram (classes and their relationships) extracted from the above scenario and/or your sequence diagram for part I above. For each class include the attributes and methods relevant to the above scenario.

5. State Diagram (7 points)

Projects in an Engineering firm go into development phases. The project is initiated by a customer request and the first stage it goes to is called “feasibility study” in which a feasibility study is carried out until approved by the firm manager. The project then goes into “pricing and scheduling” stage in which the project’s costs and development schedules are determined until a quotation is made ready. Next the project goes into “customer approval” stage and once approved is moved to “under development” stage. Once the work is completed it moves “ready for delivery” stage. After customer payment is completed it is “delivered” to the customer.

Using UML draw a suitable state diagram for a given project according to its development stages as described in the above paragraph.

6. Implementation (9 points)

The diagram below shows a many to many association class relationship between the classes *Person* and *Company*. From an object of type *Company* it is required to access all its employees' (current and previous) records and from an object of type *Person* it is required to access all his/her employers' records (current and previous). Write Java code to implement the three classes and their relationships. For each class only the constructor function and attributes need to be implemented, no other functions are required.